Marine Biology (2018) 165:93
https://doi.org/10.1007/s00227-018-3352-9

REVIEW, CONCEPT, AND SYNTHESIS

A review on the biodiversity, distribution and trophic role of cephalopods in the Arctic and Antarctic marine ecosystems under a changing ocean

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Received: 4 September 2017 / Accepted: 20 April 2018 / Published online: 30 April 2018

Abstract

Cephalopods play an important role in polar marine ecosystems. In this review, we compare the biodiversity, distribution and trophic role of cephalopods in the Arctic and in the Antarctic. Thirty-two species have been reported from the Arctic, 62 if the Pacific Subarctic is included, with only two species distributed across both these Arctic areas. In comparison, 54 species are known from the Antarctic. These polar regions share 15 families and 13 genera of cephalopods, with the giant squid *Architeuthis dux* the only species confirmed to occur in both the Arctic and Antarctic. Polar cephalopods prey on crustaceans, fish, and other cephalopods (including cannibalism), whereas predators include fish, other cephalopods, seabirds, seals and whales. In terms of differences between the cephalopod predators in the polar regions, more Antarctic seabird species feed on cephalopods than Arctic seabirds species, whereas more Arctic mammal species feed on cephalopods than Antarctic mammal species. Cephalopods from these regions are likely to be more influenced by climate change than those from the rest of the World: Arctic fauna is more subjected to increasing temperatures per se, with these changes leading to increased species ranges and probably abundance. Antarctic species are likely to be influenced by changes in (1) mesoscale oceanography (2) the position of oceanic fronts (3) sea ice extent, and (4) ocean acidification. Polar cephalopods may have the capacity to adapt to changes in their environment, but more studies are required on taxonomy, distribution, ocean acidification and ecology.

Introduction

The polar regions play an important role in Earth's processes (Allison et al. 2009; Krupnik et al. 2011). As polar environments are changing faster than any other region on Earth, changes have implications regionally and globally (Sarmiento et al. 2004; IPCC 2013; Meltofte 2013; Kennicutt et al. 2014, 2015; Screen and Francis 2016). For example, ocean temperatures in the Antarctic have increased to 0.17 °C (from 1950 to 1980 period), while the Arctic Ocean temperature has increased to 1.3 °C (from 1990 to 2005 period) (Gille 2002; Walczowski and Piechura 2006), and more than 2 °C in some areas (since the 1960's) (IPCC 2001; Moritz et al. 2002; Vaughan et al. 2003). Furthermore, polar

Responsible Editor: G. Pierce.

Reviewed by M. R. Lipinski and undisclosed experts.

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